At pages 6 and 7 of the previous response attorney for applicant also argued that the allegedly obvious modification of Amimori et al would change (eliminate) the mechanism (operative principle) by which the articles of Amimori et al allow removal of fingerprints from a surface. In answer to this argument, at at the top of page 6 of the final rejection, the Examiner provides two different rebuttals:

> "[1] As stated above Applicant has not provided any evidence that the materials used in Amimori have a "very low" wet tension. [2] Also, Applicant has not shown how the use of a higher wet tension material in Amimori would alter the invention of Amimori."

The first point raised by the Examiner, regarding burden of proof, has already been addressed above. The Examiner's second point seems to ignore the data at column 31 of Amimori on which the Examiner originally relied. The results of tests reported by Amimori at column 31, lines 17-21, demonstrate one reason why the extremely low surface tension fluorine-containing is preferred as taught at column 13, lines 58-65. Further evidence is the consistency between the teaching in the paragraph spanning pages 1 and 2 of applicants' specification, the data at column 31, lines 17-21 of Amimori and the teaching at column 13, lines 58-65 of Amimori.

The rejection of claims 6, 11 and 13 for obviousness, as stated in section 5 of the office action, is traversed for substantially the same reasons given above. Hasuo et al (US 6,716,513) is cited for its disclosure of two different size matting agents. Hasuo et al is directed to a hydrophilic coating and is not relevant to the issue of alleged obviousness of substituting a material providing a wet tension of 25 mN/m or more for the "very low" wet tension material of Amimori.

In conclusion, it is respectfully requested that the Examiner reconsider and withdraw the rejections of record.

Respectfully submitted,
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#1

Fluoro carbons in textile finishing

By : J. Gunaseelan

Introduction

Nanotechnology has real commercial potential for the textile industry. This is mainly due to the fact that conventional methods used to impart different properties to fabrics often do not lead to permanent effects, and will lose their functions after laundering or wearing.

Nanotechnology can provide high durability for fabrics, because nano-particles have a large surface area-to-volume ratio and high surface energy, thus presenting better affinity for fabrics and leading to an increase in durability of the function. In addition, a coating of nano-particles on fabrics will not affect their breath ability or hand feel. Therefore, the interest in using nanotechnologies in the textile industry is increasing.

The properties imparted to textiles using nanotechnology include water repellence, soil resistance, wrinkle resistance, antibacteria, anti-static and UV-protection, flame retardation, improvement of dye ability and so on.

What Is Fluoro Carbon?

Fluorocarbons are chemical compounds that contain carbon-fluorine bonds. The relatively low reactivity and high polarity of the carbon-fluorine bond imparts unique characteristics to fluorocarbons. Fluorocarbons tend to be only slowly broken down in the environment and therefore many are considered persistent organic pollutants. Many commercially useful fluorocarbons also contain hydrogen, chlorine, or bromine Stain and water repellency. If the critical surface tension of a solid fabric is greater than or equal to the surface tension of a liquid, the liquid will wet the fabric. If the critical surface tension of the solid is less than surface tension of the liquid, the fabric will repel the liquid.

In the case of solids 'critical surface tension' is used instead of 'surface tension'. Thus, water repellency can be attained when the critical surface tension of the solid is smaller than surface tension of the liquid. For example, when a drop of water is dripped on a cotton fabric, it has been experimentally determined that the surface tension of water and the critical surface tension of cotton are, respectively, 72 dyne/cm and 200 dyne/cm, and, therefore, water readily wets the cotton fiber. However, once the cotton is treated with a fluorocarbon the water repellent relation between them changes. The critical surface tension of water repellent finished cotton is less than the surface tension of water.

Fluorocarbons are organic compounds consisting perfluorinated carbon chain. They tend to decrease the surface tension of the substrate. Fluorocarbons generally lower the surface tensions by forming a thin film of coating around the fiber. They usually are cationic in nature but can also be non-ionic and anionic. Some useful fluorocarbons are perfluoroalkyl acrylate copolymers and their fundamental structure resembles that of acrylic resins. The surface tension of the fluorocarbon water repellent agent is extremely small, about 10 dyne/cm. Therefore, water repellency can be attained and a water drop does not adhere on the treated cotton fiber. Industry started using water repellents based on paraffin, silicone and fluorocarbons. Comparing the three systems, it was found that those belonging to the paraffin type have low water repellent effect at the initial stage and no durability to washing. Those of the silicone type were better than the paraffin-based products but were poor oil repellents. The fluorocarbon-based products were found to endow excellent oil and water repellency.

Addition of crosslinking agents along with the fluorocarbon improved the durability of water and oil repellency. Fluorocarbons can be applied in a number of ways. They can be applied by padding, kiss coating, spray, foam and exhaust. The padding method is one of the most commonly used for treating fabrics with fluorocarbons, because of the consistency and completeness of fabric coverage that can be achieved. In the case of treatment of garments with fluorocarbons, the exhaust or spray methods can be used. Treatment with fluorocarbons has to be carefully carried out, as the quality of the water and oil repellent properties are much dependent on the right kind of processing.

Crosslinking agents are indispensable for improving the durability of fluorocarbon water repellent agents. They prevent the water-repellent agents from dropping out of the fibers on washing, because they form a three dimensional network and attach the water repellent agent to the fiber. Generally, when adhering material B to the surface of material A, the more the physical properties of two materials are similar, the more strongly they

#2

UnitConversion.org

Surface Tension Converter

From:
25

- newton/meter [N/m]
- millinewnon/meter [mN/m]
- gram-force/centimeter [gf/cm]
- dyne/centimeter [dyn/cm]
- erg/square centimeter [erg/cm^2]
- erg/square millimeter [erg/mm^2]
- poundal/inch [pdl/in]
- pound-force/inch [lbf/in]

To:
25

- newton/meter [N/m]
- millinewnon/meter [mN/m]
- gram-force/centimeter [gf/cm]
- dyne/centimeter [dyn/cm]
- erg/square centimeter [erg/cm^2]
- erg/square millimeter [erg/mm^2]
- poundal/inch [pdl/in]
- pound-force/inch [lbf/in]

Result:
25 millinewnon/meter = 25 dyne/centimeter

How to use Surface Tension Converter

Select the unit to convert *from* in the input units list. Select the unit to convert *to* in the output units list. Enter the value to convert *from* into the input box on the left. The conversion result will immediately appear in the output box.

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